EDL Model Validation

Completed Technology Project (2012 - 2017)

Project Introduction

The model and tools used for EDL analysis of reentry spacecraft require careful experimental validation using ground and flight data.

Anticipated Benefits

NASA funded: Improve prediction of Mars entry environments to facilitate instrumentation selection and placement and analysis of returned data for MEDLI-2. Data taken in the CUBRC LENS facility used a model with instrumentation at a superset of MEDLI locations to facilitate flight data analysis. NASA unfunded: Deliver new aerothermal and TPS modeling capabilities which will increase fidelity and reduce uncertainty, margin and system mass for TPS design for future missions. At the current time there is no accepted way to obtain flight relevant data for Mars entry aerothermodynamics at high enthalpy on the ground. This task will investigate the applicability of two different domestic facilities (CUBRC LENS-xx and CalTech HET) and will provide recommendations to NASA on their utility for future mission design. In addition, the resulting data will be used to update current Mars aerothermal models. OGA: There is no direct benefit to OGA's as Mars aerothermodynamics is a NASA unique problem. Commercial: All of EDL Modeling and Simulation is of direct benefit to commercial space. Commercial companies generally rely on NASA developed tools for in-house EDL analysis (including aerothermodynamics and TPS response), and thus directly benefit from improvements to those tools. Several commercial companies, notably Space-x, have expressed a desire to go to Mars, and will directly benefit from higher fidelity models with lower uncertainty. Nation: EDL Modeling and Simulation is an enabling capability for spaceflight. Our ability to conduct larger and more complex missions is limited first and foremost by cost, which is a strong function of how well we understand the required system performance. By developing higher fidelity, more accurate predictive M&S capability we enable the customer to make better informed decisions and to better understand performance limits of current and future technologies. A natural consequence is increased reliability, lower mass, and a better understanding of when a fundamentally new technology is in fact required to meet mission objectives.

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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Ames Research Center (ARC)

Responsible Program:

Game Changing Development

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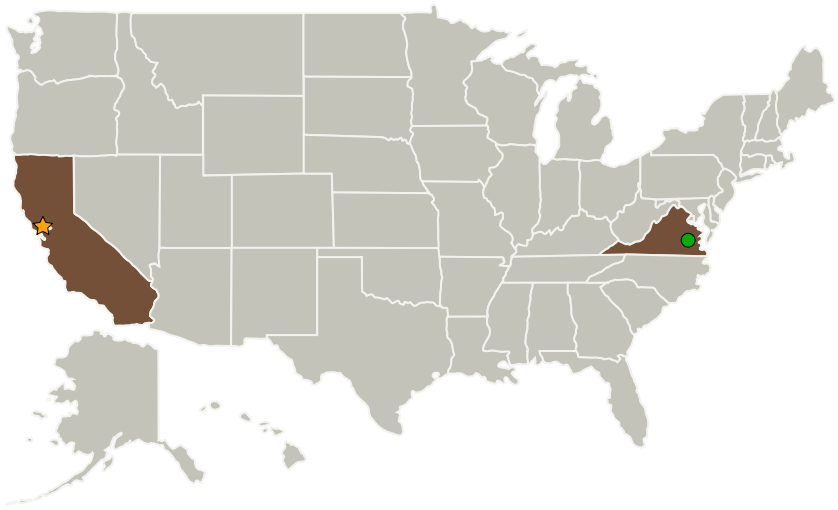
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★Ames Research Center(ARC)	Lead Organization	NASA Center	Moffett Field, California
California Institute of Technology(CalTech)	Supporting Organization	Academia	Pasadena, California
CUBRC, Inc.	Supporting Organization	Industry	
●Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

Primary U.S. Work Locations	
California	Virginia

Project Transitions

October 2012: Project Start

Project Management

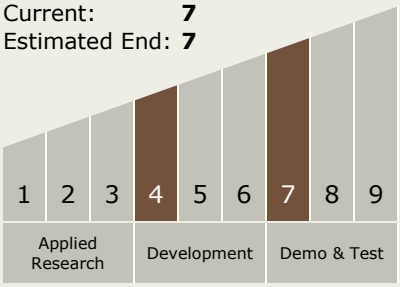
Program Director:
Mary J Werkheiser

Program Manager:
Gary F Meyering

Principal Investigator:
Michael J Wright

Technology Maturity (TRL)

Start: **4**
Current: **7**
Estimated End: **7**



Target Destinations

Mars, Earth

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September 2017: Closed out

Closeout Summary: This technology achieved its key performance parameters for a database. However, there are no TRL metrics for this technology.

Project Website:

https://www.nasa.gov/directorates/spacetech/home/index.html